

# METHOD AND APPARATUS TO ROUTE PACKET FLOWS OVER TWO TRANSPORT RADIOS

## TECHNICAL FIELD

[0001] The exemplary and non-limiting embodiments of this invention relate generally to wireless communication systems, methods, devices and computer programs and, more specifically, relate to traffic switching between a cellular radio and a another radio, where the cellular radio can be compliant with, for example, LTE/LTE-A and the other radio can be compliant with, for example, WiFi.

## BACKGROUND

[0002] This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued, but are not necessarily ones that have been previously conceived, implemented or described. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in the application and is not admitted to be prior art by inclusion in this section.

[0003] The following abbreviations that may be found in the specification and/or the drawing figures are defined as follows:

- [0004] 3GPP third generation partnership project
- [0005] Wi-Fi Wireless Fidelity, the wireless local area network (WLAN) technology based on the IEEE 802.11 standard. IEEE 802.11 covers technologies certified as IEEE 802.11a/b/g/n/ac/ad/af/s/i/v for example.
- [0006] AP Wi-Fi access point
- [0007] APN access point name
- [0008] DHCP dynamic host configuration protocol
- [0009] eNB evolved NodeB, base station in a LTE/LTE-A network
- [0010] EPS evolved packet system
- [0011] GTP general packet radio service (GPRS) tunnel protocol
- [0012] GTP-u GTP tunnel for user plane traffic
- [0013] LTE Long Term Evolution, a technology standardized by 3GPP
- [0014] LTE-A LTE-Advanced, a technology evolution step of LTE standardized by 3GPP
- [0015] NAS non-access stratum
- [0016] PDCP packet data convergence protocol
- [0017] PDN GW packet data network gateway, a gateway in a mobile operator's network to service network connectivity of a UE
- [0018] SDU service data unit
- [0019] STA WiFi station
- [0020] TEID tunnel endpoint identifier of the GTP-u tunnel
- [0021] UE user equipment, e.g., a cellular phone, smart phone, computing device such as a tablet
- [0022] USIM universal subscriber identity module
- [0023] Additional abbreviations that may appear in the description or drawings include:
- [0024] ARQ automatic repeat request
- [0025] DL downlink (eNB towards UE)
- [0026] eNB E-UTRAN Node B (evolved NodeB)
- [0027] EPC evolved packet core
- [0028] E-UTRAN evolved UTRAN (LTE)
- [0029] GGSN gateway GPRS support node
- [0030] GPRS general packet radio service

- [0031] HARQ hybrid automatic repeat request
- [0032] IMTA international mobile telecommunications association
- [0033] ITU-R international telecommunication union-radiocommunicator sector
- [0034] MAC medium access control (layer 2, L2)
- [0035] MM/MMB mobility management/mobility management entity
- [0036] OFDMA orthogonal frequency division multiple access
- [0037] O&M operations and maintenance
- [0038] PCRF policy charging and rules function
- [0039] PDCP packet data convergence protocol
- [0040] PHY physical (layer 1, L1)
- [0041] Rel release
- [0042] RLC radio link control
- [0043] RRC radio resource control
- [0044] RRM radio resource management
- [0045] SGSN serving GPRS support node
- [0046] S-GW serving gateway
- [0047] SC-FDMA single carrier, frequency division multiple access
- [0048] UL uplink (UE towards eNB)
- [0049] UPE user plane entity
- [0050] UTRAN universal terrestrial radio access network
- [0051] One modem communication system is known as evolved UTRAN (E-UTRAN, also referred to as UTRAN-LTE or as E-UTRA).
- [0052] One specification of interest is 3GPP TS 36.300 V 10.5.0 (2011-09) Technical Specification 3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Radio Access Network: Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 10) referred to for simplicity hereafter as 3GPP TS 36.300.
- [0053] FIG. 1A reproduces FIG. 4.1 of 3GPP TS 36.300 and shows the overall architecture of the EUTRAN system (Rel-8). The E-UTRAN system includes eNBs, performing functions of base stations, providing the E-UTRAN user plane (u-Plane, PDCP/RLC/MAC/PHY) and control plane (c-Plane, RRC) protocol terminations towards the UEs. The eNBs are interconnected with each other by means of an X2 interface. The eNBs are also connected by means of an S1 interface to an EPC, more specifically to a MME by means of a S1 MME interface and to a S-GW by means of a S1 interface (MME/S-GW 4). The S1 interface supports a marry-to-marry relationship between MMEs/S-GWs/UPEs and eNBs.
- [0054] The eNB hosts the following functions: functions for RRM; RRC, Radio Admission Control, Connection Mobility Control, Dynamic allocation of resources to UEs in both UL and DL (scheduling); IP header compression and encryption of the user data stream; selection of a MME at UE attachment; routing of User Plane data towards the EPC (MME/S-GW); scheduling and transmission of paging messages (originated from the MME); scheduling and transmission of broadcast information (originated from the MMB or O&M); and a measurement and measurement reporting configuration for mobility and scheduling.